Planning a Monthly Budget: A Goal Programming Approach

You are currently planning on how to allocate your monthly budget to a variety of areas including bills, savings, and fun activities. You have $1500 coming in this month to allocate to these areas. In addition, you had quite a bit of fun over the summer and have racked up a credit card debt of $1000. This will become important in planning this month's budget.

Your bills include: (1) $600 of rent, (2) $150 of utilities, (3) $100 for your cell phone, and (4) $100 minimum payment for your credit card bill. You must pay *all* of your bills; however, you may pay more than the minimum payment for your credit card bill. Any payment towards your credit card bill over the minimum $100 will pay down your outstanding debt, which saves you on interest in the long run. Therefore, you consider 25% of any dollar paid beyond the minimum to go towards 'savings' in the long run.

You have the option of directly putting money into a separate savings account as well. Historically, you have determined that 35% of any money you put into the savings account ends up being spent on vacations (and, therefore, you count it as fun in the long-term). Note that you still count all of the money directly put into the account as savings, it is just 35% can be classified as fun as well.

In terms of fun activities, you have a $200 commitment for tickets to an upcoming concert. You also consider 50% (or, equivalently, $50) of your cell phone bill to be 'fun' since you use it as entertainment. You can also designate a certain amount as 'pocket money' which you use when going out with your friends.

You have the following goals this month for your budget: (a) you want to dedicate at least $1100 towards your bills, (b) you want to put exactly $300 towards savings, and (c) you want to have at least $600 worth of fun. Without any overlap between activities in these three areas, you clearly cannot achieve all these goals. However, note that since some of the activities are cross-cutting (for example, money directly into savings has that 35% of it is 'fun' in the long run), it may be possible to meet the goals.

We will formulate a goal program of this budgeting situation. We will then consider a situation where we do not care about exceeding the bills or fun goals and then view the following the same: (a) every $50 short of the bill goal, (b) every $25 away from the savings goal, and (c) every $30 short of the fun goal. We will formulate this situation as a linear program.